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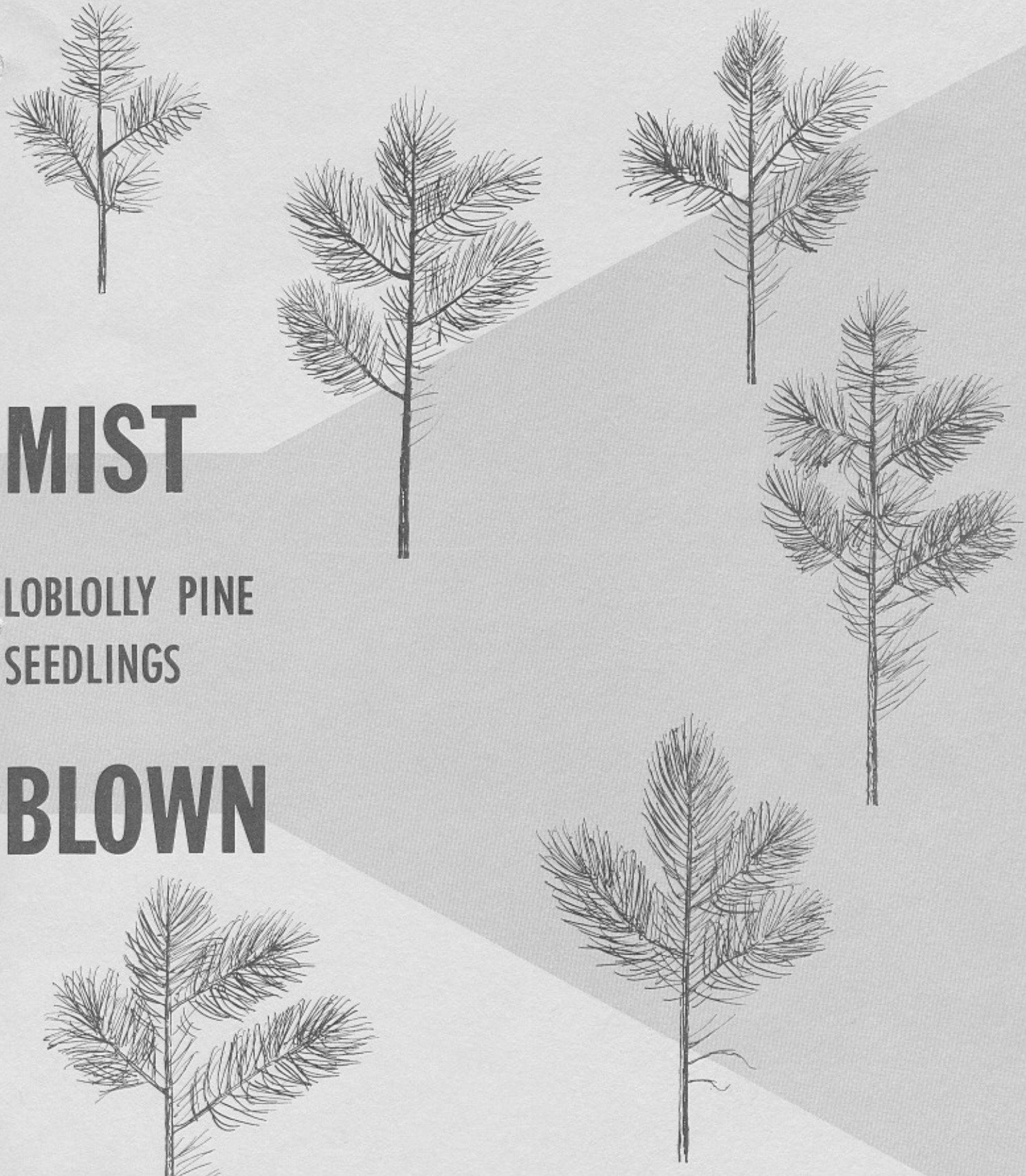

MIST

LOBLOLLY PINE SEEDLINGS

BLOWN

Virginia Division of Forestry
Department of Conservation and Economic Development

DAMAGE FROM MIST-BLOWING TO RECENTLY PLANTED AND GERMINATED LOBLOLLY PINE SEEDLINGS

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ABSTRACT

The purpose of this study was to obtain information on damage from mist-blowing to recently established loblolly pine seedlings. Plots were established on three areas which were planted and two which were direct seeded with loblolly pine during 1963 and 1964. Mist-blowing, using 2 pounds of 2, 4, 5-T per acre, was done during June, July, and August of the planting or seeding year.

Survival on control plots was higher than on mist-blown plots and averaged 6, 19, and 44 percentage points higher on the three planted areas and 22 and 28 percentage points higher on the two direct seeded areas. Differences in survival due to the month in which mist-blowing was done were not large or consistent.

Height growth of surviving seedlings was initially reduced by mist-blowing; most of the growth loss occurring during the first two years. Mist-blown seedlings recovered, however, and by the fifth year were growing as rapidly as seedlings on control plots in most cases.

DESCRIPTION OF STUDY

In 1963 and 1964, both direct seeded and planted seedlings were mist-blown during the same year the seeding or planting was done. Mist-blowing was done at three different times: the last week in June, mid-July, and mid-August in 1963; and mid-June, mid-July, and mid-August in 1964. Untreated control plots were installed with the mist-blowing plots.

A mixture containing a low volatile ester of 2, 4, 5-T (butoxy ethanol ester) was applied at the following per acre rate:

2, 4, 5-T	—	½ gallon (4 lbs. acid equivalent per gallon)
oil	—	½ gallon
water	—	4 gallons
TOTAL		5 gallons

The chemical was applied with a back-pack mist-blower. The nozzle of the mist-blower was held horizontally so the seedlings would not receive a direct blast.

Plots were installed on five different areas, three planted and two direct seeded, on the Appomattox-Buckingham and Pocahontas State Forests. All five areas were prepared by bulldozing and, in addition, three of the areas were disced. Unreplicated plots were installed on two areas because of lack of space. Plots were installed in June prior to the first mist-blowing, and were either 1/10 or ¼ acre in size with 100-foot isolation strips between plots. From 35 to 50 permanently marked seedlings, evenly distributed over each plot, served as a sample for survival and growth. This information is summarized in Table 1.

TABLE 1. SUMMARY OF PLOT DATA

Year	Forest	Type Seedling	Size Plot	Replications	Site Preparation	No. of Sample Seedlings/Plot
1963	Pocahontas	Seeded	1/10	1*	dozed & disced	50
	Appomattox	Planted	¼	3	dozed	35
1964	Appomattox	Seeded	¼	3	dozed & disced	40
	Appomattox	Planted	¼	2	dozed	40
	Appomattox	Planted	¼	1	dozed & disced	40

*Three pairs of plots were installed: June, July, and August spray plots, each with a control plot.

None of the areas "needed" release. Since the mist-blowing was done during the season following site preparation, very few pine seedlings were overtopped by hardwood sprouts and brush. Consequently, the test for the pine seedlings was severe as there was little hardwood growth to intercept the chemical. In normal release operations hardwoods intercept some of the chemical spray mixture.

The soils on the plots on the Appomattox-Buckingham State Forest are in the Tatum and Nason series. These are well-drained soils with a very fine sandy loam surface. On the Pocahontas State Forest, the June and July plots are on a well-drained Appling sandy loam; and the August plots are on a poorly-drained Worsham sandy loam.

Rainfall was below normal during the growing season during both 1963 and 1964. The rainfall data in Table 2 is from the Annual Summary of Climatological Data by the U.S. Department of Commerce. The Richmond weather station is about 13 miles from the plots on the Pocahontas State Forest, and the Farmville weather station is about 17 miles from the plots on the Appomattox State Forest.

TABLE 2. RAINFALL DATA

		Monthly Departure from Normal						Six Month
Year	Station	April	May	June	July	August	September	Total
1963	Richmond	— 2.51	— 1.33	+ 3.26	— 5.09	— 1.79	— .45	— 7.91
	Farmville	— 2.88	— 1.60	— 2.32	+ .56	— 3.61	— 1.21	—11.06
1964	Farmville	— .76	— 1.89	— 3.14	— .92	— 1.55	— 1.28	— 9.54

All marked seedlings were tallied for survival and measured for total height at the end of each growing season until the seedlings were five years old.

RESULTS AND DISCUSSION

SURVIVAL

Shortly after mist-blowing, seedlings developed the usual symptoms of 2, 4, 5-T damage: burning of foliage, curling and twisting of leaders, and top dieback. Most of the mortality from mist-blowing occurred during the first year, but on some plots a considerable amount of "delayed" mortality occurred during the second year. After the second year there was little change in survival. There were no consistent differences in survival between the three different months in which the mist blowing was done. Survival through age five is summarized in Table 3.[1]

1. Where treatments were replicated, analyses of variance were made using average survival percents at age five transformed to arc sin. Duncan's New Multiple Range Test was used to compare individual treatments:
1963 planting — no significant differences
1964 direct seeding — control better than all three spray dates at .01 level; no significant differences between spray dates.
1964 planting (dozed only) — control better than all three spray dates at .01 level; July better than August and June spraying at .05 level.

TABLE 3. SURVIVAL

Year	Method of Establishment	Treatment	Average Survival Percent at Age 1	2	3	4	5
1963	Directing Seeding	Control	100	96	96	96	96
		June Spray	86	76	76	74	74
		Control	98	96	96	96	96
		July Spray	82	70	70	70	70
		Control	90	86	84	84	84
		August Spray	78	67	67	65	65
	Planting	Control	96	96	95	94	94
		June Spray	86	82	82	82	82
		July Spray	96	95	94	94	94
		August Spray	97	90	89	88	88
1964	Direct Seeding	Control	98	97	97	97	95
		June Spray	79	73	72	72	72
		July Spray	73	66	66	66	66
		August Spray	77	65	65	65	65
	Planting (dozed only)	Control	99	99	99	99	99
		June Spray	77	76	74	74	74
		July Spray	88	88	88	88	88
		August Spray	88	78	78	78	78
	Planting (dozed & disced)	Control	100	100	100	100	100
		June Spray	68	68	68	68	68
		July Spray	68	62	60	60	60
		August Spray	45	42	40	40	40

The difference in results between the two areas planted in 1964 is interesting because these areas are on the same tract, separated by a stream branch. Both areas were bulldozed at the same time during the previous summer, early enough that considerable resprouting occurred by the end of the season. The discing that was done in the fall on one side of the stream branch destroyed practically all of this resprouting. Consequently, the area that was only bulldozed had enough hardwood growth to intercept an appreciable amount of the spray (even though the area was not yet in "need" of release – normally release would have been delayed a year or two). The area that was both bulldozed and disced, on the other hand, was very open when mist-blown and the seedlings probably got a heavier dose.

Both 1963 and 1964 were dry years. Mist blowing is usually not as effective in controlling hardwoods when soil moisture is in short supply, and the same may be true with respect to damage to pine seedlings. Consequently, during a normal season greater mortality of pine seedlings might occur.

HEIGHT GROWTH

Height growth was reduced by mist-blowing, with most of the growth loss occurring during the first two years. During the third and fourth year mist-blown seedlings recovered, and by the fifth year there were no consistent differences in height growth between control seedlings and mist blown seedlings.

The month in which the mist-blowing was done appears to have had some effect on height growth, because in most cases June seedlings are tallest, and August seedlings shortest. This may be due entirely to differences in recovery

time: seedlings mist-blown in June had had the longest recovery time when measurements were made in the fall. By the fourth and fifth growing seasons there was no consistent relationship between annual height growth and month of mist-blowing.

Height growth through age five is summarized in Table 4, which is based on trees still alive at age five (sample size was constant for all five years.)[2]

TABLE 4. HEIGHT GROWTH

Year	Method of Establishment	Treatment	Average Height Growth In Inches by Year 1*	2	3	4	5	Total Height At Age 5
1963	Direct Seeding	Control	5	15	29	33	37	119
		June Spray	4	12	26	31	39	112
		Control	6	18	33	30	38	125
		July Spray	6	15	26	26	35	108
		Control	6	13	20	23	23	85
		August Spray	5	9	20	21	27	82
	Planting	Control	13	23	35	32	47	150
		June Spray	11	20	37	35	51	154
		July Spray	11	18	33	31	46	139
		August Spray	11	15	30	31	45	132
1964	Direct Seeding	Control	5	19	23	39	32	118
		June Spray	4	16	23	40	34	117
		July Spray	3	13	23	41	34	114
		August Spray	4	11	23	42	34	114
	Planting (dozed only)	Control	13	25	23	39	35	135
		June Spray	11	20	28	49	43	151
		July Spray	14	20	26	44	38	142
		August Spray	12	14	25	46	38	135
	Planting (dozed & disced)	Control	14	30	31	47	40	162
		June Spray	8	20	27	46	40	141
		July Spray	10	15	24	47	41	137
		August Spray	11	8	25	49	45	138

*For planted seedlings this actually represents two year's growth: the year in the nursery and the first year in the field.

Even though pine seedlings on the plots did not "need" release when the mist-blowing was done, there was some benefit from hardwood control. No data were collected on hardwood density, but in general, more seedlings are being adversely affected by hardwood competition on control plots than on mist-blown plots. This may explain why on some areas, mist-blown seedlings are catching up to and passing control seedlings in average total height.

2. Where treatments were replicated, analyses of variance were made of average total height at age two (when percentagewise, differences between treatments were greatest) and at age five. Duncan's New Multiple Range Test was used to compare individual treatments. In the table below, treatments not bracketed are different at the .05 level of significance:

Treatment	1963 Planted Age 2	1963 Planted Age 5	1964 Seeded Age 2	1964 Seeded Age 5	1964 Planted (dozed only) Age 2	1964 Planted (dozed only) Age 5
Control	]	]	]	]	]	]
June Spray	]	]	]	]	]	]
July Spray	]	]	]	]	]	]
August Spray	]	]	]	]	]	]